MULTIMEDIA UNIVERSITY

STUDENT ID NO

Seat No.: | | | |

Venue: _____

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2015/2016

TGD2151 – Computer Graphics Fundamentals
TCS2111 - Computer Graphics

(All sections / Groups)

01 March 2016
9.00 a.m. – 11.00 a.m.
(2 Hours)

Question No.	Marks
1	
2	
3	
4	
Total	

INSTRUCTIONS TO STUDENTS

1. This Question Paper consists of 12 pages with 4 Questions only.

2. Answer **ALL FOUR** questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please write all your answers CLEARLY in this Question Paper.

Question 1

a) i) Explain why RGB color model used in display devices is an additive color system and CMY color model used in printers is a subtractive color system?

[2 marks]

ii) What is the expected color when yellow light and cyan light are mixed together?

[1 mark]

iii) What is the expected color when yellow ink and cyan ink are mixed together?

[1 mark]

iv) What color would be observed if a yellow piece of paper is viewed through a cyan filter under white light.

[1 mark]

Continued...

b) What are the advantages of the HSV color model over RGB color model?

[2 marks]

c) A RGB raster system has a pixel depth of 4 bits per pixel and a resolution of 256 by 400.

i) How many pixels are there in one full screen?

ii) What is the frame buffer size in Kilobytes (KB)?

iii) How many possible distinct colors can be represented?

[3 marks]

Question 2

a) Given 3 points A(0, 0, 1), B(2, 2, 1), and C(1, 2, 2) on a plane,

i) write the plane equation for the plane defined by the triangle.

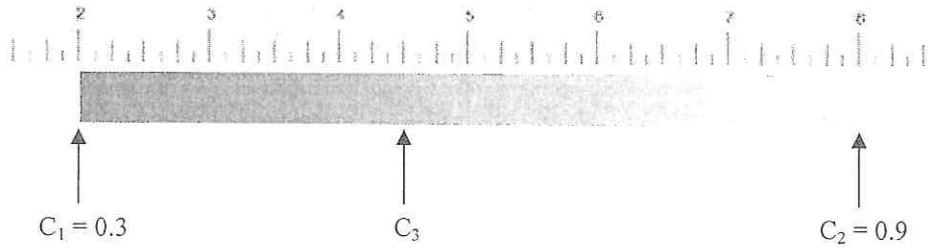
[2 marks]

ii) if the point P = (x, 3, 2) lies on the plane, what is the value for x?

[1 mark]

Continued...

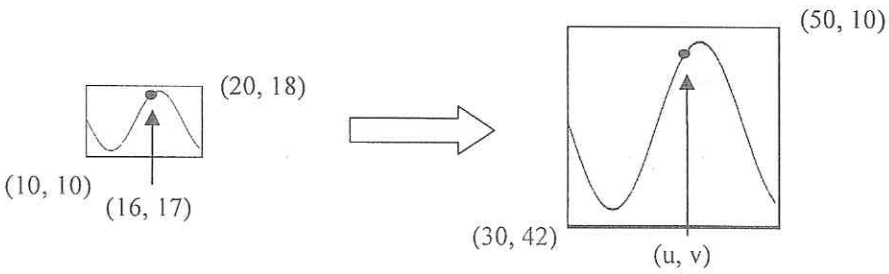
b) The figure below shows a strip of paper being colored using linear grey-valued color gradient method. C_1 , C_2 and C_3 are color intensity values at the three positions as indicated by the ruler. Compute C_3 .



[3 marks]

Continued...

c) In the figure below, the window on the left is scaled to become the window on the right. The coordinates of the corner points are specified in the figure. A point (16, 17) in the left window is mapped to become the point (u, v). Compute the coordinates (u,v).



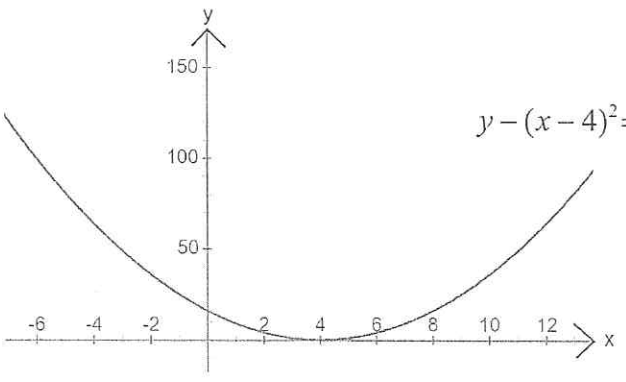
[4 marks]

Continued...

Question 3

a) Below is a curve $f(x,y) = y - (x - 4)^2 = 0$, shade and label the region where $f(x,y) < 0$ and the region where $f(x,y) > 0$.

[2 marks]



Continued...

b) Given the following steps of midpoint algorithm for curve $y - (x - 4)^2 = 0$,

$x_{k+1} = x_k + 1$
midpoint = $(x_k + 1, y_k + ½)$,

write the expression for the decision parameter p_k.

[2 marks]

c) Given the following C++ code segment for the midpoint algorithm for drawing a line between point (ax, ay) = (4, 2) and point (bx, by) = (10, 6), compute the pixel coordinates of the next three pixels by completing the table.

```
int h = by - ay;
int w = bx - ax;
int incrIfFNegative = 2 * h;
int incrIfFNotNegative = 2 * (h - w);
int F = 2 * h - w;
int y = ay;
for (int x = ax; x <= bx; ++x) {
   setPixel(x, y);
   if (F < 0)
      F += incrIfFNegative;
   else {
     ++y;
     F += incrIfFNotNegative;
   }
}
```

[3 marks]

Continued...

k	x_k	y_k	F_k
0	4	2	
1	5		
2	6		
3	7		

Continued...

d) A 3D point P is being rotated 90^0 about x-axis and then rotated 270^0 about y-axis. Compute the transformation matrix M associated with the composite transformation.

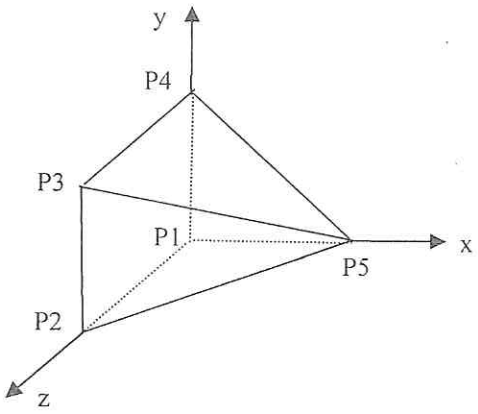
[3 marks]

Continued...

Question 4

a) Construct the vertex table, edge table and the polygon table for the object below. The coordinates of the points are given on the right.

[3 marks]



P1 = (0, 0, 0)
P2 = (0, 0, 5)
P3 = (0, 5, 5)
P4 = (0, 5, 0)
P5 = (5, 0, 0)

Vertex Table

Index	Vertex
1	
2	
3	
4	
5	

Edge Table

Index	Edge
1	
2	
3	
4	
5	
6	
7	
8	

Polygon Table

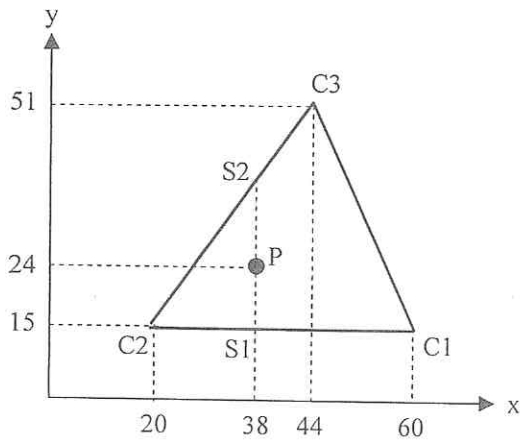
Index	Polygon
1	
2	
3	
4	
5	

b) Given three 2D control points of a quadratic Bezier curve being P_1 = (0.0, 100.0), P_2 = (0.0, 0.0) and P_3 = (100.0, 0.0), find y such that the curve passes through the point P_5 = (64.0, y).

[3 marks]

Continued...

c) In the following figure, C1, C2 and C3 represent the RGB colors at the vertices of the polygon as shown below, with the color values given on the right. Compute the RGB values of the color at point P using Gouraud surface rendering method.



C1 = (1.0, 0.0, 1.0)
C2 = (1.0, 0.0, 1.0)
C3 = (0.0, 1.0, 0.0)

[4 marks]

End of Examination Paper.